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Amphibians and reptiles of Isla Santay (Durán, Ecuador)

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Abstract. Amphibian and reptile diversity from Isla Santay (Durán, Ecuador) has been underestimated due to the lack of monitoring throughout the island. Historically, this island has also been affected by anthropic landscape changes which limit the occurrence of certain species and favors the dispersion of opportunistic or more tolerant species. Such species dynamics tend to be more evident on islands, since their isolation limits species' mobility. We present an updated checklist of the herpetofauna of Isla Santay Durán, Ecuador, and report for the first time the occurrence of two introduced species, *Anolis sagrei* Duméril & Bibron, 1837, Brown Anole, and *Hemydactylus frenatus* Duméril & Bibron, 1836.

Keywords. Guayas, introduced species, urban diversity, wetland.

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Introduction

Expansion of agricultural and urban frontiers has caused deforestation, pollution, and the introduction of exotic species in ecosystems worldwide. These anthropic pressures have altered the dynamics of native communities and species compositions in fragmented ecosystems (Gascon et al. 1999; Ricketts 2001; Dixo and Metzger 2009). Terrestrial and aquatic ecosystems in Ecuador are currently highly fragmented, causing the displacement of entire groups of species, the decrease of sensitive species, and local extension events (Lehtinen et al. 2003; Lehtinen and Ramanamanjato 2006; Wilson and Townsend 2006; Cole et al. 2013; Lesbarrères et al. 2014; Steihnke 2016). Mangroves are particularly threatened, disappearing worldwide by 1–2% per year, a rate of deforestation greater than that of tropical rainforests, yet the issue has been widely unnoticed in the public eye (World Wildlife Fund 2015). Currently, mangrove forests in Ecuador occupy just 1906 km^2 (Hamilton and Casey 2016), since a large proportion of this ecosystem has been converted to aquaculture ponds and pastures. Ecuadorian coastal mangrove forests have been significantly impacted by anthropic activities in areas where diversity has not been fully characterized; this has significantly affected communities of amphibians and reptiles.

A site that has been exposed to agricultural and

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urban expansion in Ecuador is Isla Santay. This island is 4705 ha in area and located on the central-south Ecuadorian coast. It is part of the Municipality of Durán (Guayas province) at the delta of the Guayas River. Isla Santay is a national protected area and was declared a Ramsar site in 2000 (Jaramillo et al. 2000). According to the Ecuadorian Ministry of the Environment, Water and Ecological Transition (MAE 2013), there are two native ecosystems on Isla Santay: Jama-Zapotillo Mangrove and Jama-Zapotillo lowland riparian floodplain grassland; however, there is also dry forest vegetation on the island (León-Yánez et al. 2011; Cruz-Cordovez et al. 2019). These ecosystems are affected by historical and ongoing anthropic activities. In the early 1900s, Isla Santay stood out for its cattle and rice production; consequently, native vegetation cover disappeared and was replaced by grasslands where artificial lagoons were also built. However, the island was expropriated by the Ecuadorian government in 1970, and the process of regenerating the vegetation began in the abandoned productive areas (Jaramillo et al. 2002). Currently, approximately 198 people inhabit the island's southwest (Jaramillo et al. 2000). This section makes up less than 1% of the island's area, and it is considered a tourist attraction, as it is used for residents' homes, schools, and meeting places (Jaramillo et al. 2000).

Several inventories have reported the terrestrial fauna in wetlands on the island. However, there are very few herpetofaunal records from Isla Santay, which limits its conservation initiatives. Eight species were listed in the Ramsar (2000) information sheet, including three species of snakes (*Boa imperator* Daudin, 1803; *Leptodeira ornata* (Bocourt, 1884); *Bothrops asper* (Garman, 1884)), three species of lizards (*Iguana iguana* (Linnaeus, 1758); *Ameiva* sp., *Stenocercus iridescens* (Günther, 1859)), one turtle (*Chelydra acutirostris* Peters, 1862), and one amphibian (*Rhinella horribilis* (Wiegmann, 1833)). Jaramillo et al. (2002) later added five reptile species (*Phyllodactylus reissii* Peters, 1862; *Holcosus septemlineatus* (Duméril, 1851); *Drymarchon melanurus* (Duméril, Bibron & Duméril, 1854); *Leptophis occidentalis* (Günter, 1859); *Oxybelis transandinus* Torres-Carvajal, Mejía-Guerrero & Terán, 2021), and one more amphibian species (*Engystomops guayaco* Ron, Coloma & Cannatella, 2005). Samaniego et al. (2011) expanded the species list to 20 species by including two additional reptile species (*Crocodylus acutus* (Cuvier, 1807); *Gonatodes caudiscutatus* (Günther, 1859)) and two amphibian species (*Scinax quinquefasciatus* (Fowler, 1913); *Leptodactylus labrosus* Jiménez de la Espada, 1875); however, some were reported from interviews only, and there are synonyms reported for one species (*Ophryoessoides iridescens* synonym of *Stenocercus iridescens*). Later, Zavala-Becilla (2017) reported 12 frog species, including two arboreal species (*Trachycephalus jordani* (Stejneger & Test, 1891) and *Trachycephalus quadrangulum* (Boulenger, 1882)) and the invasive species *Lithobates catesbeianus* (Shaw, 1802). Finally, Cruz-Cordovez et al. (2020, 2021) observed seven species of amphibians, including *L. catesbeianus*. To reflect the true herpetological diversity of the site, complementary surveys are needed. Here, we assess the composition of the herpetological community on Isla Santay in order to encourage better conservation strategies. We present an updated list of the herpetofauna of Isla Santay based on eight independent surveys.

Study Area

We surveyed Isla Santay, a Ramsar wetland ecosystem, located in Municipality of Durán at the start of the Guayas River, and in the middle Guayaquil, Durán, and Samborondón, which are three large coastal cities in Guayas province. This wetland is part of National System of Protected Areas in Ecuador (SNAP by its Spanish acronym) under the category of Recreational National Area (Samaniego et al. 2011). Based on location and floral composition, we selected three sampling areas comprised of pre-constructed paths, which are hereafter referred to as "transects" (Fig. 1):

1) **Southern path:** includes trails from the southern entrance of the island toward the island's ecovillage. This transect is characterized by mangrove forest, dry forest, and grassland ecosystems and was less disturbed than transects 2 and 3. Mangrove forests are dominant in the southern path and included *Rhizophora mangle* L. (Red Mangrove), *Rhizophora racemose* G.Mey. (Crawling Red Mangrove), *Rhizophora harrisonii* Leechm. (Knight Red Mangrove), and *Conocarpus erectus* L. (Button Mangrove). The dry forest and grassland ecosystems are characterized by the family Fabaceae, with 18 species, followed by Cyperaceae and Acanthaceae, with four species each. Trees and herbs were also predominant, with 30 and 26 species, respectively, followed by 15 species of shrubs, five species of lianas, and two species of palms.

2) **Terraplén path:** connects the southern path (transect 1) and our third transect that ran towards Durán city. This second transect is characterized by mangrove forest, dry forest, and grassland ecosystems, with 80 plant species from 72 genera distributed in 39 families. However, grassland and dry forest make up the most substantial vegetation cover. In contrast, the mangrove forest occurs only at the beginning and end of the transect. The mangrove forest includes *Conocarpus erectus*, *Avicennia germinans* (L.) L. (Black Mangrove), *Laguncularia racemosa* (L.) C.F.Gaertn. (White Mangrove), and the family Acanthaceae. In the transitional areas, herbaceous plants and trees are dominant, with 36 and 25 species, respectively, followed by 11 species of shrubs, three species of lianas, three species of epiphytes, and two species of palms.

3) **Touristic path:** the most impacted by anthropic pressures and comprised of several trails near the island's ecovillage and bike lane. The only remaining ecosystem in this transect was a mangrove forest, including black, white, and button mangroves. The infrastructure for tourism and the establishment of the

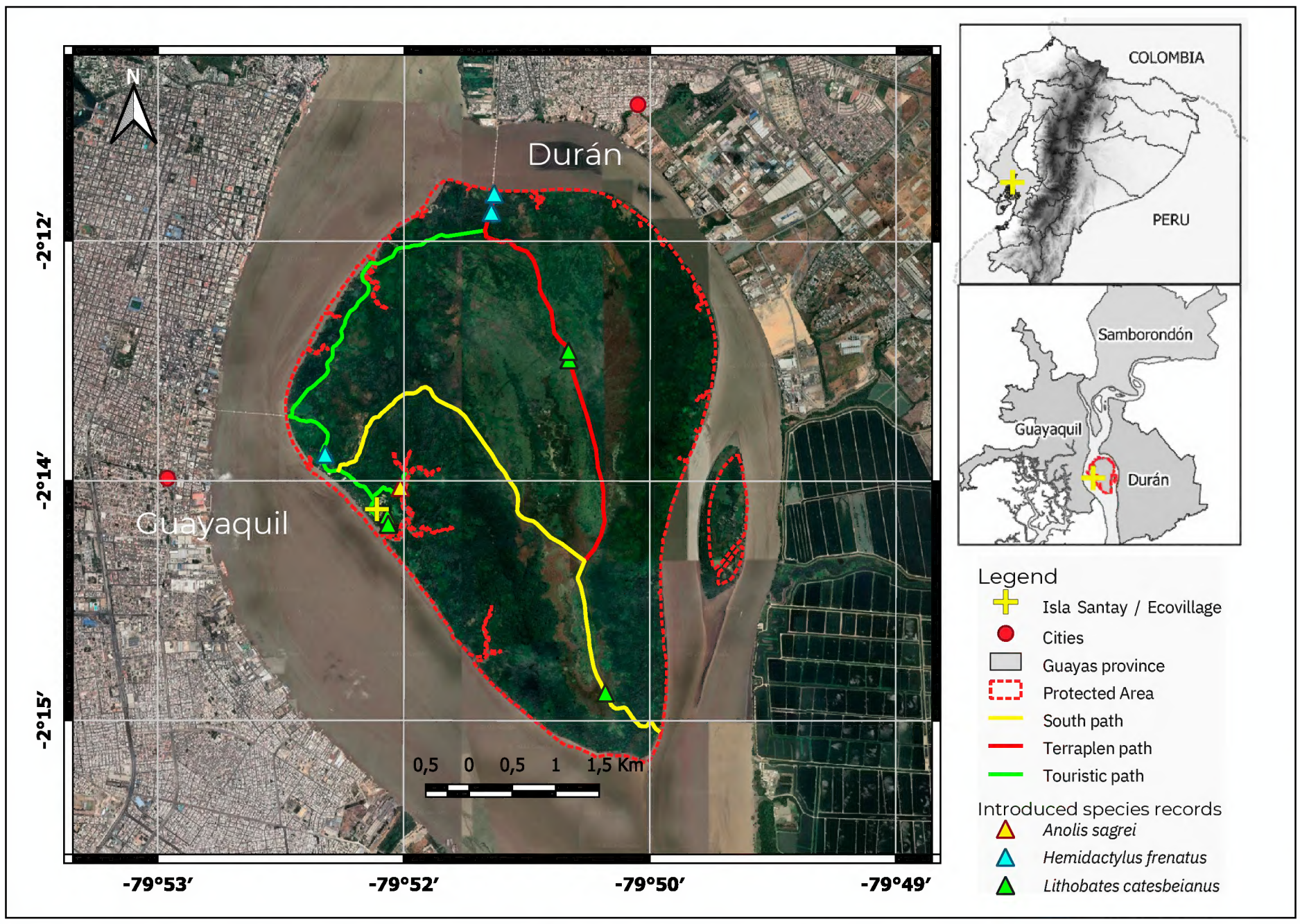

Figure 1. Map of the study area of Isla Santay (Durán, Guayas, Ecuador). Surveyed paths are indicated by colored lines on the map. sighting spots of the introduced species are indicated on the map (triangles).

island ecovillage have altered the natural water flow of the lagoons on the island. These alterations have helped dry forest and exotic plant species (42 tree species, 38 herb species, 14 shrub species, seven liana species, and three palm species) occupy the natural mangrove ecosystem (León-Yánez et al. 2011; Cruz-Cordovez et al. 2019).

Methods

This research includes multiple surveys performed between 2010 and 2022, following non-systematic sampling, free and unrestricted search, acoustic and visual records, and manual captures (Rödel and Ernst 2004). Surveys were complemented with opportunistic findings, lifting rocks and detritus, scraping through leaf litter, climbing mangroves, and looking in holes in mangrove trunks. Each survey varied in effort (duration and number of observers) and area of the island sampled.

Terraplén path and touristic path were surveyed repeatedly. J. Salas surveyed between 18:00 and 21:00 in August 2010, November 2016, November 2017, and January 2018. K. Cruz-García surveyed between 18:00 and 22:00 in December 2014 and April 2016. A. Narváez and K. Cruz-García performed day (11:00–16:00) and night (18:00 and 24:00) surveys in February 2018, 2019, and January 2020. M. Moretta-Urdiales and two additional surveyors sampled day (11:00–16:00) and night (18:00 and 24:00) between June and July 2018. M. Barreno and S. Cuadrado sampled three areas (southern path, Terraplén path, and touristic path) during the rainy (February and March 2022) and dry (May 2022) seasons. They carried out nocturnal (18:00–00:00) and diurnal (11:00–15:00) surveys with three and five additional surveyors. Most animals were released after identification, but 61 individuals were collected as vouchers and sent to the Escuela Superior Politécnica del Ecuador (EPN) and Pontificia Universidad Católica del Ecuador (QCAZ) museum collections. Specimens collected from 2017 to 2020 were euthanized using 2% Roxicaine solution and fixed in 10% formalin solution, while individuals collected in 2022 were fixed in 90% alcohol. All specimens were stored in jars with 70% alcohol. Specimens were collected under permit no. MAE-DNB-CM-2017-0068 and no. MAAE-DBI-DBI-CM-2022-0222, approved by the Ecuadorian Ministry of the Environment, Water and Ecological Transition.

Results

During our surveys on Isla Santay from 2010 to 2022 we recorded 434 sightings, which document 32 species of herpetofauna, which include 12 amphibian and 20 reptile species belonging to 16 families (Table 1). Three species are introduced. The most frequently observed amphibian species was *Leptodactylus labrosus* (204

Table 1. List of species found at Isla Santay. The proportion of individuals observed at each sampling area between 2010 and 2022 are included, and IUCN (2022) Red List categories for the species reported: Least Concern (LC), Vulnerable (VU), Near Threatened (NT), Not Evaluated (NE). Color gradient indicates low (red) and high (green) abundance of sightings.

Higher taxa	Family	Genus	Species	Southern path	Terraplén	Touristic path	IUCN category
Anura	Bufonidae	*Rhinella*	*horribilis*	0.06	0.02	0.06	NE
Anura	Hylidae	*Scinax*	*quinquefasciatus*	0.01	0.06	0.02	LC
Anura	Hylidae	*Scinax*	*tsachila*		0.14	0.01	NE
Anura	Hylidae	*Trachycephalus*	*jordani*	0.02	0.02	0.09	LC
Anura	Hylidae	*Trachycephalus*	*quadrangulum*		0.04	0.05	NE
Anura	Leptodactylidae	*Engystomops*	*guayaco*		0.01		VU
Anura	Leptodactylidae	*Leptodactylus*	*labrosus*	0.73	0.41	0.28	LC
Anura	Leptodactylidae	*Leptodactylus*	*melanonotus*	0.00		0.01	LC
Anura	Ranidae	*Lithobates*	*catesbeianus*	0.01	0.02	0.02	LC
Anura	Strobomantidae	*Barycholos*	*pulcher*		0.02		LC
Anura	Strobomantidae	*Pristimantis*	*achatinus*			0.00	LC
Crocodylia	Crocodylidae	*Crocodylus*	*acutus*		0.01	0.03	VU
Squamata: Sauria	Alopoglossidae	Alopoglossus	festae			0.00	LC
Squamata: Sauria	Gekkonidae	*Hemidactylus*	*frenatus*	0.02		0.22	LC
Squamata: Sauria	Iguanidae: Dactyloinae	*Anolis*	*binotatus*			0.01	LC
Squamata: Sauria	Iguanidae: Dactyloinae	*Anolis*	*festae*		0.02	0.02	NT
Squamata: Sauria	Iguanidae: Dactyloinae	*Anolis*	*sagrei*			0.00	LC
Squamata: Sauria	Iguanidae: Iguaninae	*Iguana*	*iguana*			0.04	LC
Squamata: Sauria	Iguanidae: Tropidurinae	*Stenocercus*	*iridescens*	0.02	0.02	0.04	LC
Squamata: Sauria	Phyllodactylidae	*Phyllodactylus*	*reissii*			0.02	LC
Squamata: Sauria	Sphaerodactylidae	*Gonatodes*	caudiscutatus	0.01		0.03	LC
Squamata: Sauria	Teiidae	*Holcosus*	*septemlineatus*			0.01	LC
Squamata: Serpentes	Boidae	*Boa*	*imperator*		0.03	0.00	LC
Squamata: Serpentes	Colubridae: Colubrinae	*Drymarchon*	*melanurus*		0.01		LC
Squamata: Serpentes	Colubridae: Colubrinae	*Lampropeltis*	*micropholis*			0.00	LC
Squamata: Serpentes	Colubridae: Colubrinae	*Leptophis*	*occidentalis*	0.04	0.04		
Squamata: Serpentes	Colubridae: Colubrinae	*Oxybelis*	*transandinus*		0.02	0.01	NE
Squamata: Serpentes	Colubridae: Colubrinae	*Oxyrhopus*	*petolarius*			0.00	LC
Squamata: Serpentes	Colubridae: Dipsadinae	Dendrophidion	brunneum			0.00	LC
Squamata: Serpentes	Colubridae: Dipsadinae	*Leptodeira*	*ornata*	0.07	0.04	0.04	NE
Squamata: Serpentes	Viperidae	*Bothrops*	*asper*			0.00	LC
Testudines: Cryptodira	Chelydridae	*Chelydra*	*acutirostris*		0.02		NE

individuals), and the most frequently observed reptile species was *Hemidactylus frenatus* (76 individuals).

Class Amphibia
Order Anura
Family Bufonidae

***Rhinella horribilis* (Wiegmann, 1833)**
Figure 2A

Material examined. ECUADOR – Guayas • Durán, Isla Santay, Touristic path; 02°13′34″S, 079°50′43″W; alt. 6 m; 24.II.2022; M. Barreno leg.; found on leaf litter; 1 (sex indet.), QCAZ 77727 • Durán, Isla Santay, Terraplén path; 02°13′34″S, 079°50′43″W; alt. 5 m; 3.III.2022; M. Barreno leg.; found on stones near the water; 1 ♂, QCAZ 77855 • Durán, Isla Santay, Touristic path; 02°13′34″S, 079°50′43″W; alt. 0 m; 24.V.2022; S. Cuadrado leg.; hidden between shrubs; 1 ♂, QCAZ 77931 • Durán, Isla Santay, Touristic path; 02°13′34″S, 079°50′43″W; alt. 0 m; 24.V.2022; S. Cuadrado leg.; hidden between shrubs; 1 ♂, QCAZ 77932 • Durán, Isla Santay, Touristic path; 02°13′34″S, 079°50′43″W; alt. 0 m; 24.V.2022; S. Cuadrado leg.; hidden on shrubs; 1 (sex indet.), QCAZ 77975.

This species was found on trails in the interior of the island, mainly in areas with human activity; few individuals were observed in less disturbed sites.

Identification. This is large to very large, brown toad, with an SVL of 95–109 mm. It lacks expanded discs on the fingers and has large and prominent parotoid glands. There are membranes between the toes. Fingers and toes are robust, with lateral skinfolds, distally ending in knots and webbed between the toes (Savage 2002; Venegas and Ron 2014; Acevedo et al. 2016).

Distribution. In Ecuador, the distribution of *R. horribilis* includes the coast, western foothills of the Andes, and the inter-Andean region. In addition, this species is distributed from southern Texas (USA) to northern Peru and west to the Andes range. It occurs at altitudes of 0–2900 m above sea level (Acevedo et al. 2016; Páez-Rosales and Ron 2019).

Family Hylidae

***Scinax quinquefasciatus* (Fowler, 1913)**
Figure 2B

Material examined. ECUADOR – Guayas • Durán, Isla Santay, Terraplén path; 02°12′59″S, 079°50′50″W; alt. 10 m; 24.II.2022; M. Barreno leg.; perched on a branch; 1 (sex indet.), QCAZ 77728 • Durán, Isla Santay, Terraplén path; 02°12′41″S, 079°50′56″W; alt. 8 m; 24.II.2022; M. Barreno leg.; perched on rock near a lagoon; 1 (sex indet.), QCAZ 77729 • Durán, Isla Santay, Terraplén path; 02°12′54″S, 079°50′52″W; alt. 0 m; 11.II.2018; A. Narváez and K. Cruz-García leg.; perched on rock near a lagoon; 1 (sex indet.), EPN 15875 • Durán, Isla Santay, Terraplén path; 02°12′34″S, 079°52′20″W; alt. 0 m; 4.I.2020; A. Narváez and K. Cruz-García leg.; on a branch; 2 (sex indet.), QCAZ 78004, QCAZ 78005.

This species was abundant in seasonal and dry lagoons located in the island's center. Individuals were actively calling from the banks and perching on nearby branches.

Identification. This is a medium-sized, light or dark brown frog with a cream belly; the SVL is 32–36 mm. There are generally continuous dorsal stripes, and most individuals have a dark, triangular marking on the head. It has smooth to granular skin on the back, with scattered to abundant tubercles (Ron et al. 2018).

Distribution. It is distributed in the Pacific lowlands of Colombia and Ecuador. In Ecuador, it is found in the provinces of Esmeraldas, Pichincha, Santo Domingo de Los Tsáchilas, Manabí, Los Ríos, Guayas, Cañar, and El Oro. In addition, it is introduced on Isabela and Santa Cruz islands of the Galápagos archipelago. This species occurs between 20 and 600 m above sea level (Lever 2003; MECN 2010; ASW 2016).

***Scinax tsachila* Ron, Duellman, Caminer, & Pazmiño, 2018**
Figure 2C

Material examined. ECUADOR – Guayas • Durán, Isla Santay, Terraplén path; 02°12′46″S, 079°50′54″W; alt. 13 m; 24.II.2022; M. Barreno leg.; perched on a rock near lagoon; 1 (sex indet.), QCAZ 77730 • Durán, Isla Santay, Terraplén path; 02°12′46″S, 079°50′54″W; alt. 11 m; 24.II.2022; M. Barreno leg.; perched on rock near lagoon; 1 (sex indet.), QCAZ 77731.

Identification. This is a medium-sized (31–35 mm), cream or reddish-brown frog with or without brown dorsal lines. There are no tubercles on the heel, and the eardrum is evident. The most similar sympatric species is *Scinax quinquefasciatus*. It differs by the presence of small, scattered tubercles on the back (absent in *S. tsachila*) and in having white leg bones that are barely visible through the skin (green and very dark in *S. tsachila*) (Ron et al. 2018; Varela-Jaramillo 2019).

Distribution. It is distributed in the Pacific basin of Ecuador, from the province of Esmeraldas to El Oro. The presence of *S. tsachila* in Colombia and Peru is presumed, due to its proximity to the borders of both countries, but this has not been confirmed. It occurs between 0 and 1207 m above sea level (Ron et al. 2018; Varela-Jaramillo 2019).

***Trachycephalus jordani* (Stejneger & Test, 1891)**
Figure 2D

Material examined. ECUADOR – Guayas • Durán, Isla Santay, Touristic path; 02°11′59″S, 079°51′47″W; alt. 11 m; 21.II.2022; M. Barreno leg.; perched on mangrove branch; 1 (sex indet.), QCAZ 77732 • Durán, Isla Santay, Touristic path; 02°12′1″S, 079°51′53″W; alt. 7 m; 21.II.2022; M. Barreno leg.; perched on a branch; 1 (sex indet.), QCAZ 77733 • Durán, Isla Santay, Southern path; 02°13′14″S, 079°52′28″W; alt. 7 m; 23.II.2022;

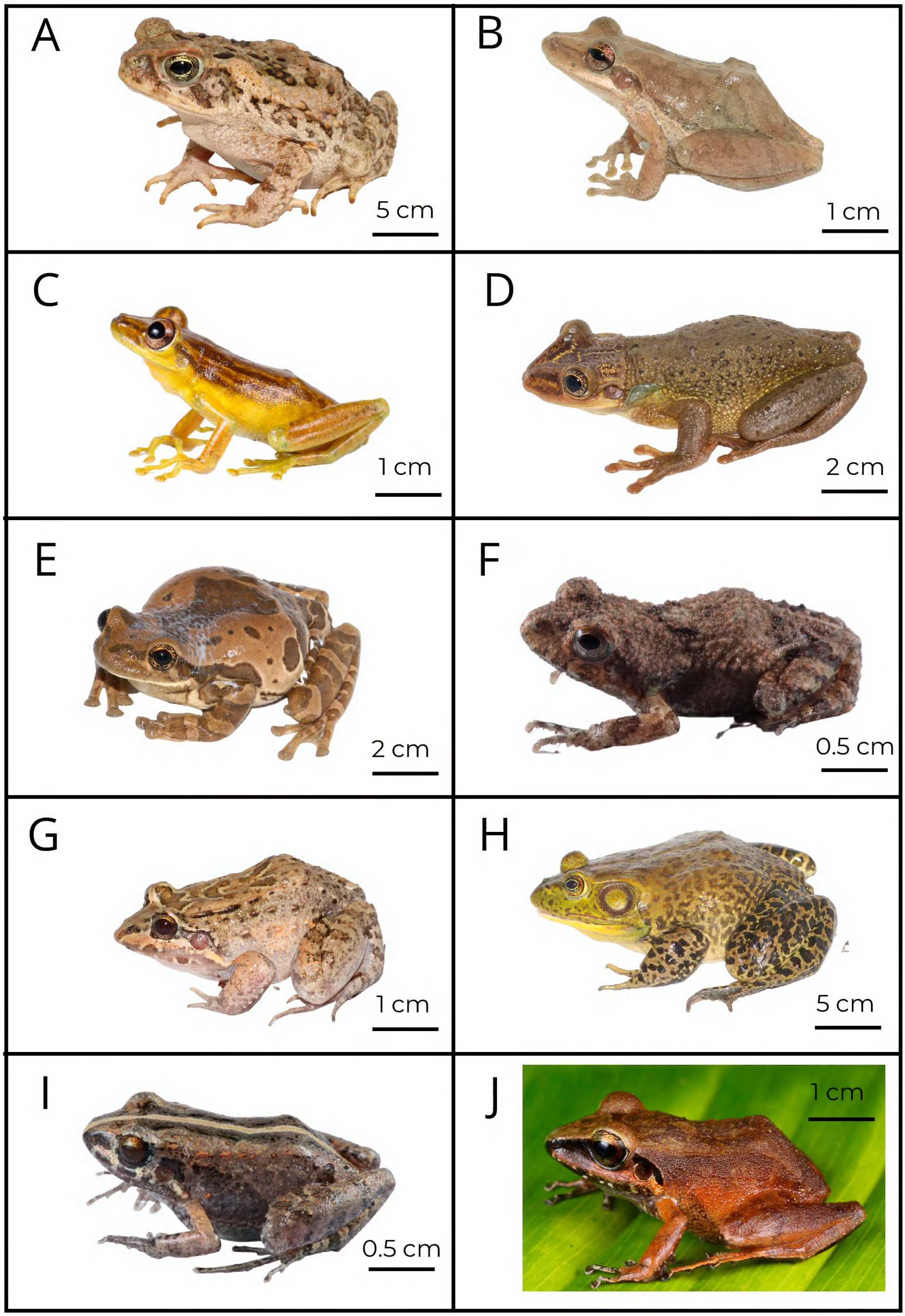

Figure 2. Amphibians found in Isla Santay (Durán Ecuador). **A.** *Rhinella horribilis*. **B.** *Scinax quinquefasciatus*. **C.** *Scinax tsachila*. **D.** *Trachycephalus jordani*. **E.** *Trachycephalus quadrangulum*. **F.** *Engystomops guayaco*. **G.** *Leptodactylus labrosus*. **H.** *Lithobates catesbeiana* (introduced species). **I.** *Barycholos pulcher*. **J.** *Pristimantis achatinus*. Photo credits: Keyko Cruz-García (C, F, J), Andrea Narváez (A, B, D, E, G–I). The scale bars are approximate.

M. Barreno leg.; perched on metal railing; 1 (sex indet.), QCAZ 77734 • Durán, Isla Santay, Southern path; 02°13′14″S, 079°52′28″W; alt. 7 m; 25.II.2022; S. Cuadrado leg.; perched on branch; 1 (sex indet.), QCAZ 77940 • Durán, Isla Santay, Touristic path; 02°13′14″S, 079°52′28″W; alt. 7 m; 26.II.2022; S. Cuadrado leg.; perched on branch; 1 (sex indet.), QCAZ 77941.

This species was found perched on natural and artificial substrates.

Identification. This is a large tree frog, which is very easy to distinguish due to the extreme ossification of its head; the SVL is 73–85 mm. The rostral ridge is very prominent, and the rear edge of the head is straight and elevated with respect to the rest of the back. There are expanded discs on the fingers, but this species differs from others by its size and in having a black iris with irregular golden spots (Read et al. 2019).

Distribution. It is distributed in the Pacific lowlands of southwestern Colombia through the coast of Ecuador to northwestern Peru, between 0 and 1000 m above sea level (Icochea et al. 2004; MECN 2010; ASW 2016).

***Trachycephalus quadrangulum* Boulenger, 1882**

Figure 2E

Material examined. ECUADOR – Guayas • Durán, Isla Santay, Touristic path; 02°13′32″S, 079°51′57″W; alt. 4 m; 03.III.2022; M. Barreno leg.; perched on artificial substrate; 1 (sex indet.), QCAZ 77735 • Durán, Isla Santay, Touristic path; 02°13′23″S, 079°52′27″W; alt. 19 m; 03.III.2022; M. Barreno leg.; perched on an artificial substrate; 1 (sex indet.), QCAZ 77736 • Durán, Isla Santay, Touristic path; 02°13′7″S, 079°52′30″W; alt. 13 m; 03.III.2022; M. Barreno leg.; foraging on artificial substrate; 1 (sex indet.), QCAZ 77737 • Durán, Isla Santay, Touristic path; 02°11′54″S, 079°51′40” W; alt. 10 m; 26.V.2022; S. Cuadrado leg.; perched on a branch; 1 (sex indet.), QCAZ 77948 • Durán, Isla Santay, Touristic path; 02°11′56″S, 079°51′20″W; alt. 5 m; 26.V.2022; S. Cuadrado leg.; perched on a branch; 1 (sex indet.), QCAZ 77949.

Identification. This is a medium-sized frog, cream or brown in color, with dark spots on its back, and a golden iris with irregular black spots; it has expanded discs on the fingers. The SVL is 69–75 mm. Due to the color of the iris, it is like *Trachycephalus jordani*, a species that inhabits the same region. However, *T. jordani* presents a highly ossified skull, its rostral edge is very prominent, and head head has a straight posterior edge which is elevated with respect to the rest of the back (slightly distinctive rostral edge in *T. quadrangulum*, posterior edge of head inconspicuous and continuous with back) (Ron et al. 2016; Ron 2018).

Distribution. It is distributed to the west of the Andes Mountain range of Ecuador, in the Chocó region, in the provinces of Esmeraldas, Manabí, Los Ríos, Guayas and El Oro. It occurs at altitudes of 20–350 m above sea level (Ron et al. 2016; Ron 2018).

Family Leptodactylidae

***Engystomops guayaco* Ron, Coloma & Cannatella, 2005**

Figure 2F

Observation. ECUADOR – Guayas • Durán, Isla Santay, Southern path; 02°14′45″S, 079°50′42″W; alt. 5 m; 25.V.2022; S. Cuadrado obs.; actively calling; 1 ♂ • Durán, Isla Santay, Terraplén path; 02°12′58″S, 079°50′51″W; alt. 5 m; 25.V.2022; A. Narváez and K. Cruz-García; actively calling; 1♂, EPN 15874.

Identification. This is a very small toad with a greyish-brown back, dark markings, a creamy subocular bar, a gray flank, and an SVL of 16–18 mm. It is characterized by scattered tubercles on the skin of its back, a truncated snout in dorsal view and rounded in lateral view, the presence of parotoid glands, the absence of a tarsal tubercle, and finger I of the hand shorter than finger II (Ron et al. 2005; Ron 2018).

This species was perched on natural substrates found in the lagoons.

Distribution. It is distributed in the lowlands of southwestern Ecuador. It has an altitude range of 32–92 m above sea level (Ron et al. 2005; ASW 2016).

***Leptodactylus labrosus* Jiménez de la Espada, 1875**

Figure 2G

Material examined. ECUADOR – Guayas • Durán, Isla Santay, Touristic path; 02°12′1″S, 079°51′52″W; alt. 15 m; 21.II.2022; M. Barreno leg.; foraging in leaf litter; 1 (sex indet.), QCAZ 77740 • Durán, Isla Santay, Southern path; 02°14′51″S, 079°50′41″W; alt. 1 m; 22.II.2022; M. Barreno leg.; foraging in leaf litter; 1 (sex indet.), QCAZ 77741 • Durán, Isla Santay, Southern path; 02°14′6″S, 079°50′52” W; alt. 10 m; 22.II.2022; M. Barreno leg.; foraging on a branch; 1 (sex indet.), QCAZ 77742 • Durán, Isla Santay, Southern path; 02°13′50″S, 079°50′44″W; alt. 11 m; 24.II. 2022; M. Barreno leg.; foraging in leaf litter; 1 (sex indet.), QCAZ 77743• Durán, Isla Santay, Southern path; 02°13′49″S, 079°50′43″W; alt. 16 m; 24.II.2022; M. Barreno leg.; foraging in leaf litter; 1 (sex indet.), QCAZ 77744 • Durán, Isla Santay, Southern path; 02°13′26″S, 079°50′44″W; alt. 5 m; 24.II.2022; M. Barreno leg.; foraging in leaf litter; 1 (sex indet.), QCAZ 77738 • Durán, Isla Santay, Southern path; 02°13′5″S, 079°50′48″W; alt. 9 m; 24.II.2022; M. Barreno leg.; foraging on the ground; 1 (sex indet.), QCAZ 77739.

Identification. This is a medium-sized toad, SVL is 56–57 mm. Unlike other *Leptodactylus* species, it is characterized by having a smooth belly, toes without membranes, lacking expanded discs on the fingers, and lacking tubercles on the soles of the feet. It may be brown or gray, with the back spotted or rarely uniform. A dark suborbital bar may or may not be present (Heyer 1978; de Sá et al. 2014).

Distribution. It is distributed in the western lowlands of the Andes of Ecuador and Peru, from the central

coastal region of Ecuador to the central coast of Peru; it occurs between sea level and 1300 m above sea level (Heyer and Peters 1971; Heyer 1978; Cisneros-Heredia 2006a; de Sá et al. 2014; ASW 2016).

***Leptodactylus melanonotus* (Hallowell, 1861)**

Material examined. ECUADOR – Guayas • Durán, Isla Santay, Terraplén path; 02°12′34″S, 079°52′20″W; alt. 10 m; 21.II.2022; A. Narváez and K. Cruz-García leg.; active on the leaf litter in a swamp; 3 (sex indet.), QCAZ 78065, QCAZ 78066, QCAZ 78067.

Identification. This is a medium-sized toad with the following characteristics: snout rounded subelliptical or rarely subovoid in dorsal view; rounded to vertically rounded in side view; loreal region slightly concave in cross section; eardrum distinct, internal single vocal sac in males; head longer than wide, rarely equal to or shorter than wide; finger I slightly longer than or equal to II; finger I shorter than III, finger II longer than IV; male with two dorsal spines on thumb; arm not hypertrophied; ulnar edge not developed; smooth head; warty upper lid, glandular or smooth; supratympanic fold extends to shoulder; sometimes with warty dorsolateral folds; ventrolateral glands little to extensively developed; male without dorsal spines on chest; toe tips usually not enlarged; no disk; toes with well-developed lateral stripes; well-developed subarticular tubercles; metatarsal crease present; tarsal fold distinct, not continuous with toe stripe; smooth foot, with "apical coni" only on the outer sole of the foot; femur longer than, equal to, or usually shorter than tibia; tibia shorter than foot; foot longer than femur (Heyer 1970; Read et al. 2022).

Distribution. This species is found in the lowlands of the Atlantic and Pacific coasts of Mexico south to Panama and extends to the humid lowlands of Colombia and Ecuador. It is found from sea level to 1550 m above sea level (Solís et al. 2010; De Sá et al. 2014).

Family Ranidae

***Lithobates catesbeianus* (Shaw, 1802)**

Figure 2H

Material examined. ECUADOR – Guayas • Durán, Isla Santay, Touristic path; 02°13′43″S, 079°52′3″W; alt. 1 m; 24.V.2022; S. Cuadrado leg.; active in vegetation; 1 (sex indet.), QCAZ 77969 • Durán, Isla Santay, Terraplén path; 02°12′38″S, 079°50′56″W; alt. 1 m; 26.V.2022; S. Cuadrado leg.; active in vegetation near the lagoon; 1 (sex indet.), QCAZ 77970.

Identification. This frog is the largest in North America and is distinguished by lacking dorsolateral folds and having large tympanums (larger than the eye in males). The tips of the fingers and toes are blunt. The skin on the back of this species is rough with tiny tubercles. There is no dorsolateral fold, but there is a prominent supratympanic fold. The mean SVL for males is 152 mm and for females is 162 mm. Males have pigmented nuptial pads, and the vocal openings are at the corner of the mouth (AmphibiaWeb 2022). The dorsum is green, with or without a net-like pattern of gray or brown on top. The venter is slightly white and sometimes mottled with gray or yellow. Coloration varies depending on the locality (Conant and Collins 1991).

Distribution. This species is widely distributed in eastern North America. It has been widely introduced for various purposes and is now common in western North America, Europe, Asia, and South America. *Lithobates catesbeianus* is aquatic and can be found primarily at the edges of lakes, swamps, and other water bodies (Conant and Collins 1991).

Family Strabomantidae

***Barycholos pulcher* (Boulenger, 1898)**

Figure 2I

Material examined. ECUADOR – Guayas • Durán, Isla Santay, Terraplén path; 02°13′43″S, 079°52′3″W; alt. 1 m; 11.II.2018; A. Narváez and K. Cruz-García leg.; active in the ground; 2 (sex indet.), EPN 15876, EPN 15877.

Identification. This is is a small-sized frog with the following combination of characters: back smooth with an hourglass pattern that runs from the interorbital region to the sacrum, which may be interrupted in the middle by a slight median dorsal stripe that extends from the tip of snout to cloaca; belly smooth, with scattered melanophores that are usually concentrated under the throat; ventral discoid fold present; head as long as wide; snout rounded in side view, as long as diameter of orbit; tongue oval, entire; distinctive rostral ridge; concave loreal region; nostrils closer to tip of snout than to eye; interorbital space as wide as upper eyelid; very distinctive tympanum, ⅔ eye diameter; vomerine teeth in two long, arched series extending beyond choana; moderate fingers, finger I slightly longer than finger II; moderate toes, no skin ridges; swollen tips of digits on hands and feet; prominent subarticular tubercles; two small prominent metatarsal tubercles; tarsal tubercles small, closer to foot than tibia; tibiotarsal joint reaching the level between the eye and the tip of the snout (Boulenger 1898; Heyer 1969; Yánez-Muñoz et al. 2022).

Distribution. It is endemic to Ecuador and is distributed in the Pacific lowlands. It has been reported in the provinces of Azuay, Bolivar, Cañar, Chimborazo, Cotopaxi, El Oro, Esmeraldas, Guayas, Imbabura, Loja, Los Ríos, Manabí, Pichincha, and Santo Domingo de Los Tsáchilas. It occurs at 30–900 m above sea level (Yánez-Muñoz et al. 2022).

***Pristimantis achatinus* (Boulenger, 1898)**

Figure 2J

Observations. ECUADOR – Guayas • Durán, Isla Santay, Touristic path; 02°13′26″S, 079°51′57″W; alt. 6 m; 16.IV.2016; K. Cruz-García obs.; perched in a shrub 2 m above the ground; 1 (sex indet.).

Identification. This species is characterized by the following characteristics: finely granulated dorsal skin with low granular dorsolateral folds and smooth belly. Subacuminate face in dorsal view, with a sharp rostral ridge. Upper eyelid without tubers; large eardrum. Males with vocal clefts. Truncated discs on finger III–IV, wider discs on fingers I and II but narrower than discs on toes; adult males with a non-thorny nuptial pad on thumb. The cantal and postorbital region has dark brown or black bands and pale cream lips. The iris is finely reticulated in black, with the pupil on a reddish-brown horizontal band that divides the eye into golden upper and greyish lower halves. The dorsal coloration varies from pale yellow to dark brown, and the back surface of the thighs is brown with small patches of cream to red (Lynch and Myers 1983; Lynch and Duellman 1997).

Distribution. This species is distributed from the eastern lowlands and mountain ranges in Panama through the lowlands and western foothills of the western Andes in Colombia and Ecuador. Its altitudinal distribution ranges from sea level to 2330 m above sea level (Ruiz-Carranza et al. 1996; Ibáñez et al. 2000; Padial et al. 2014; Ron 2018).

Class Reptilia
Order Crocodylia
Family Crocodylidae

***Crocodylus acutus* (Cuvier, 1807)**
Figure 3A

Observations. ECUADOR – Guayas • Durán, Isla Santay, Touristic path; 02°13′42″S, 079°52′3″W; alt. 6 m; 03.III.2022; M. Barreno obs.; inside an artificial lagoon; 1 (sex indet.).

Identification. This is a large crocodile; males can exceed 6 m and females can be more than 4 m. Its color is variable, from pale gray with somewhat yellowish or greenish tints to dark gray or blackish in older individuals. It has an elevation or preocular hump, which encompasses the prefrontal and nasal bones of the snout, better displayed in adult males (Álvarez del Toro 1974; Medem 1981; Thorbjarnarson 2010; Seijas 2011).

Distribution. It is distributed from the extreme southern Florida (USA), along the Pacific and Atlantic coasts of southern Mexico, Central America, and South America, along the Pacific coast of Colombia, Ecuador, and northern Peru, in the Caribbean region of Colombia and the entire coast of Venezuela. It is also present in Caribbean islands such as Cuba, Jamaica, Haiti, and the Hispanola. Its distribution extends from sea level to 1300 m above sea level. In Ecuador, it is found in lowlands from sea level to 200 m, inhabiting the mouths of large rivers in coastal areas, entering brackish and hypersaline waters and mangroves. It can colonize oceanic islands by crossing the open sea. It also occurs in coastal lagoons, fresh- or brackish-water swamps, and backwaters of large rivers and reservoirs (Rueda-Almonacid et al. 2007; Thorbjarnarson 2010).

Order Squamata
Family Alopoglossidae

***Alopoglossus festae* (Peracca, 1904)**
Figure 3B

Observations. ECUADOR – Guayas • Durán, Isla Santay, Touristic path; 02°13′30″S, 079°52′4″W; alt. 9 m; 03.III.2022; M. Barreno obs.; plastic handrail surface (sex indet.).

Identification. This species is characterized by the following characteristics: keeled scales, mostly granular, small scales on the sides of the neck; gular scales arranged in four longitudinal rows, middle pair scales widened; lanceolate dorsal scales in transverse rows; scales of dorsal-like flanks; smooth ventral scales with blunt posterior margins. The dorsal surface of the head and body is dark brown or black, the outer row of the ventral scales is moderately pigmented, and the middle rows are without pigmentation; gular and post-mental may or may not have black spots; subcaudals without pigmentation (Köhler et al. 2012; Guerra-Correa 2020).

Distribution. It is distributed on the Pacific slopes of Ecuador and southwestern Colombia, between 7 and 2917 m above sea level. In Ecuador, it has been recorded in the provinces of Esmeraldas, Pichincha, Azuay, Cañar, Chimborazo, Santa Elena, Santo Domingo de Los Tsáchilas, El Oro, Imbabura, Los Ríos, Cotopaxi, Bolívar, Guayas, and Manabí (Köhler et al. 2012; Garzón-Santomaro et al. 2019).

Family Gekkonidae

***Hemidactylus frenatus* Duméril & Bibron, 1836**
Figure 3C

Material examined. ECUADOR – Guayas • Durán, Isla Santay, Touristic path; 02°11′53″S, 079°51′26″W; alt. 9 m; 21.II.2022; M. Barreno leg.; foraging on railing; 1 (sex indet.), QCAZ 17862 • Durán, Isla Santay, Touristic path; 02°11′42″S, 079°51′ 24″W; alt. 11 m; 21.II.2022; M. Barreno leg.; perched on a branch; 1 (sex indet.), QCAZ 17863 • Durán, Isla Santay, Touristic path; 02°11′41″S, 079°51′24″W; alt. 11 m; 21.II.2022; M. Barreno leg.; foraging on railing; 1 (sex indet.), QCAZ 17864 • Durán, Isla Santay, Touristic path; 02°11′ 49″S, 079° 51′ 25″W; alt. 8 m; 21.II.2022; M. Barreno leg.; foraging on railing; 1 (sex indet.), QCAZ 17865 • Durán, Isla Santay, Touristic path; 02°13′20″S, 079°52′27″W; alt. 8 m; 24.V.2022; M. Barreno leg.; foraging on wood railing; 1 (sex indet.), QCAZ 17865.

Identification. A transparent film covers the eyes; the pupils are elliptically vertical and have serrated edges. The head, chin, and body are covered by granular scales, among which some slightly keeled scales can be seen. The ventral scales are smooth, overlapping, and much larger than the granular dorsal scales. The coloration on the back is pale gray, cinnamon, or brown with darker spots (Lee 1996).

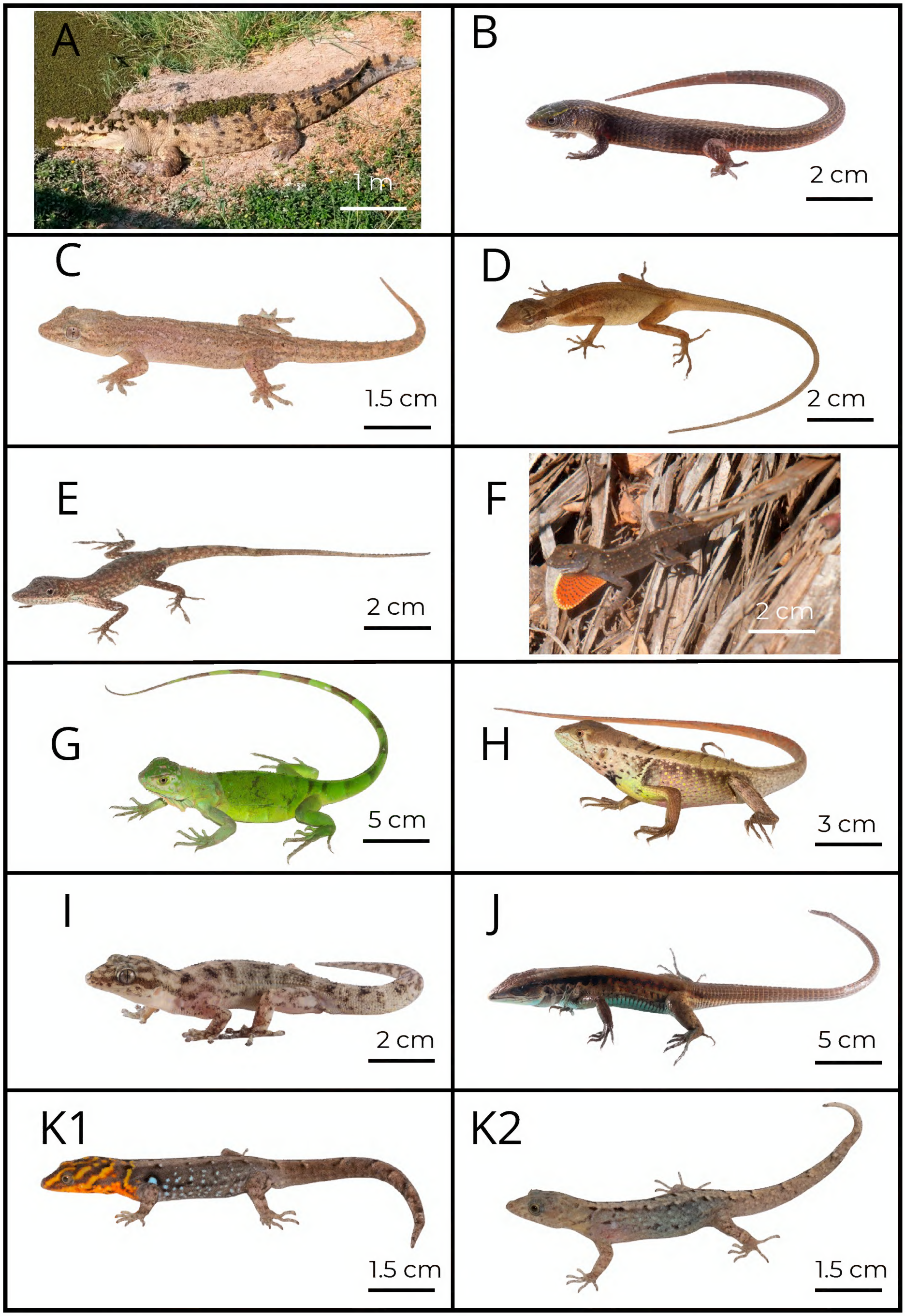

Figure 3. Reptiles found in Isla Santay (Durán Ecuador). **A.** *Crocodylus acutus*, **B.** *Alopoglossus festae*, **C.** *Hemidactylus frenatus* (introduced species), **D.** *Anolis binotatus*, **E.** *Anolis festae*, **F.** *Anolis sagrei* (introduced species), **G.** *Iguana iguana*, **H.** *Stenocercus iridescens*, **I.** *Phyllodactylus reissii*, **J.** *Holcosus septemlineatus*, **K1.** *Gonatodes caudiscutatus* (female), **K2.** *Gonatodes caudiscutatus* (male). The scale bars are approximate.

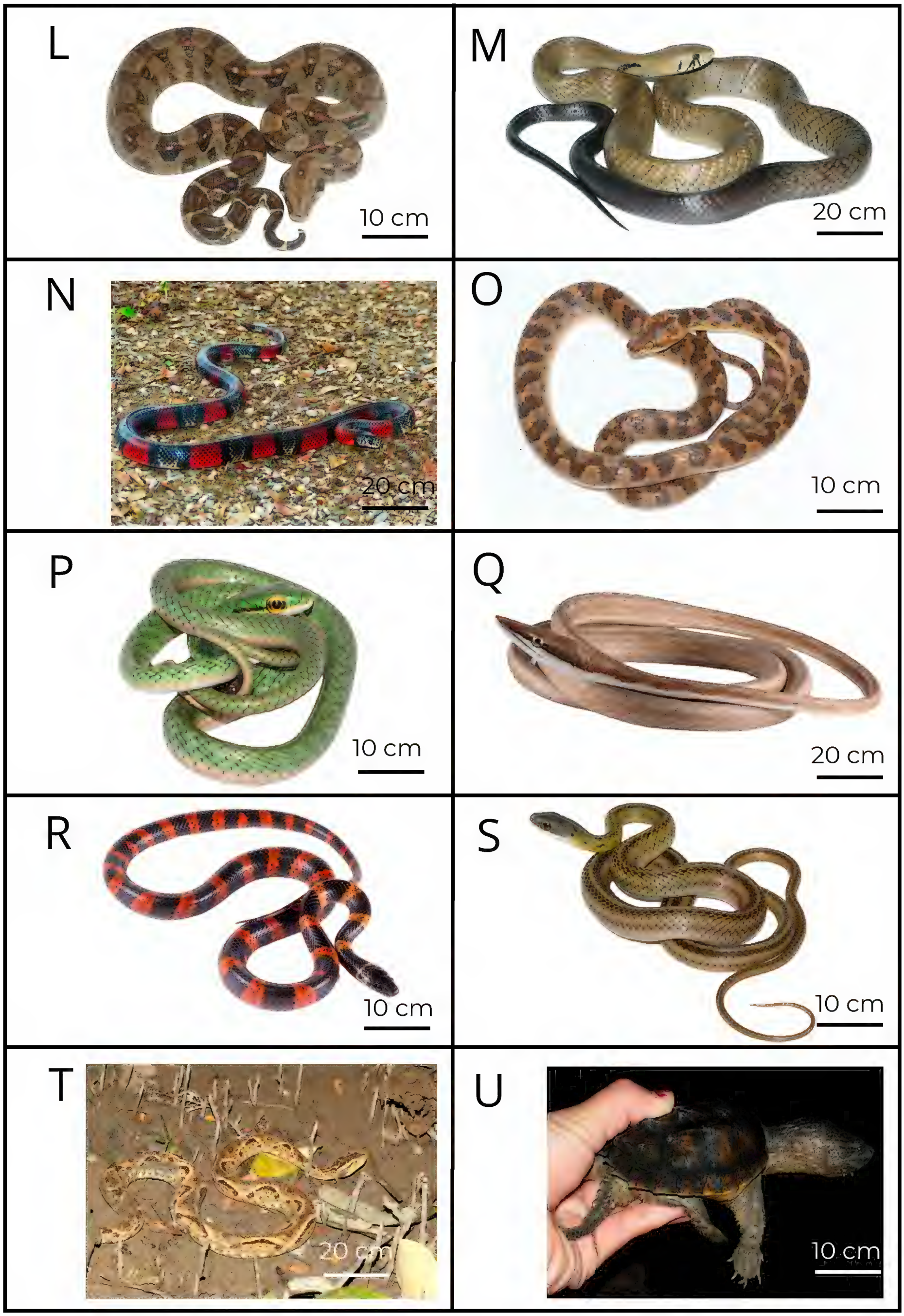

Figure 3, continued. L. *Boa imperator*, **M.** *Drymarchon melanurus*, **N.** *Lampropeltis micropholis*, **O.** *Leptodeira ornata*, **P.** *Leptophis occidentalis*, **Q.** *Oxybelis transandinus*, **R.** *Oxyrhopus petolarius*, **S.** *Dendrophidion brunneum*, **T.** *Bothrops asper*, **U.** *Chelydra acutirostris*. Photo credits: Álvaro Torres (A, F), Keyko Cruz-García (B, I, J, K1, M, N, Q, R), Andrea Narváez (C, D, E, G, H, K2, L, O, P, S, T), Eloisa Verduga (U). The scale bars are approximate.

Distribution. It is native to tropical Asia and the Indo-Pacific. It has been introduced to many tropical and subtropical regions worldwide, including the Eastern Pacific and South America. In Ecuador has been reported in El Oro, Los Ríos, Esmeraldas, Manabí, Guayas, Sucumbíos, Orellana, Pastaza, and the Galápagos. This gecko is commonly found in human settlements and is distributed at altitudes between sea level and 1600 m (Case et al. 1994; Savage 2002; Jadin et al. 2009; Carvajal-Campos and Torres-Carvajal 2010; Torres-Carvajal and Tapia 2011; Torres-Carvajal 2015; Garzón-Santomaro et al. 2019).

Family Dactyloidae

***Anolis binotatus* Peters, 1863**

Figure 3D

Material examined. ECUADOR – Guayas • Durán, Isla Santay, Touristic path; 02°13′ 31″S, 079°51′58″W; alt. 4 m; 03.III.2022; M. Barreno leg.; perched on trunk; 1 ♀, QCAZ 17865 • Durán, Isla Santay, Touristic path; 02°12′34″S, 079°52′20″W; alt. 8 m; 04.I.2020; M. Barreno leg.; perched on a vine; 1 ♀, QCAZ 17867 • Durán, Isla Santay, Touristic path; 02°12′34″S, 079°52′20″W; alt. 8 m; 04.I.2020; A. Narváez and K. Cruz-García leg.; perched on shrub; 1 ♂, QCAZ 17986.

Identification. This is a small brown lizard differentiated from other co-occurring anoles in having a white ventrolateral stripe, inverted chevrons on the back, and a brown iris; males have an orange dewlap (Castro-Herrera and Ayala 1988; Williams et al. 1995; Poe 2019).

Distribution. It is distributed in Colombia and the western foothills of Ecuador. In Ecuador, it has been reported in the provinces of Azuay, Bolívar, Cañar, Chimborazo, Cotopaxi, El Oro, Esmeraldas, Guayas, Los Ríos, Manabí, and Santo Domingo de Los Tsáchilas between 44 and 1282 m above sea level (Uetz et al. 2017; Garzón-Santomaro et al. 2019).

***Anolis festae* (Peracca, 1904)**

Figure 3E

Material examined. ECUADOR – Guayas • Durán, Isla Santay, Touristic path; 02°11′57″S, 079°51′38″W; alt. 7 m; 21.II.2022; M. Barreno leg.; perched on trunk; 1 ♀, QCAZ 17867 • Durán, Isla Santay, Terraplén path; 02°12′34″S, 079°52′20″W; alt. 6 m; 9.II.2018; A. Narváez and K. Cruz-García.; perched on trunk 1 ♂, EPN 15869 • Durán, Isla Santay, Terraplén path; 02°12′34″S, 079°52′20″W; alt. 6 m; 9.II.2018; A. Narváez and K. Cruz-García leg; perched on trunk; 1 ♀, EPN 15870.

Identification. This species belongs to the *punctatus* group; it is characterized by small adults with an SVL of up to 50 mm. It has a slim body, elongated face, an olive-green coloration and an immaculate belly. It is white with a black base, and there is a large gular sac in males. The iris is blue. It is the only anole species with black coloration at the base of its gular sac and an immaculate belly (MECN 2010).

Distribution. It is distributed in Colombia and Ecuador. In Ecuador, it has been reported in the provinces of Chimborazo, Cotopaxi, El Oro, Esmeraldas, Guayas, Manabí, Santo Domingo de Los Tsáchilas, and Los Ríos between sea level and 350 m above sea level (Peracca 1904; Valencia et al. 2008; Garzón-Santomaro et al. 2019; Pinto-Erazo et al. 2020).

***Anolis sagrei* Duméril & Bibron, 1837**

Figure 3F

Observations. ECUADOR – Guayas • Durán, Isla Santay, Touristic path; 02°13′29″S, 079°51′58″W; alt. 10 m; 21.VIII.2022; A. Torres obs.; perched on royal palm trunk; 1 ♀, 1 ♂.

Identification. This species is distinguished by the combination of the following characteristics: small and slender body reaching a maximum total length of 21 cm; elongated, narrow head; long tail in both sexes, almost twice as long as the rostro-cloacal length; limbs long, with slender digits which are delineated on their lower sides by expanded digital pads, each composed of a series of lamellae. Body light brown to almost black able to change coloration. Males have a large, orange to red gular fold with a whitish border; females and juveniles are brown to gray on the dorsum, with dark or pale markings on the sides and a conspicuous whitish, dorsomedial stripe with dark, wavy edges. Iris brown or green; ear openings visible; body covered with small keeled, granular scales (Conant and Collins 1991; Rodriguez-Schettino 1999; Norval et al. 2002; Tan and Lim 2012).

Distribution notes. This species is native to Cuba, the Bahamas, the Caribbean coast of Mexico, the Cayman Islands, other islands adjacent to Mexico, and the Caribbean satellite islands. It is an invasive species in Florida, USA, and currently, it is reported from 12 countries in the Americas and Asia. Introduced populations of *A. sagrei* have also been reported in South America from Ecuador and Brazil, as well as Hawaii, Taiwan, and Singapore (Garman 1887; Kraus 2009; Mautz and Shaffer 2011; Tan and Lim 2012; Granatosky and Krysko 2013; Norval et al. 2016; Amador et al. 2017). In Ecuador, this species has been only seen in the cities of Guayaquil and Samborondón (Amador et al. 2017; Narváez et al. 2020), but we present the first record from in Durán, where it was living in a native ecosystem.

Family Iguanidae

***Iguana iguana* (Linnaeus, 1758)**

Figure 3G

Material examined. ECUADOR – Guayas • Touristic path; 02°13′30″S, 079°52′11″W; alt. 14 m; 27.V.2022; S. Cuadrado leg; active perching on vines; 1 (sex indet.), QCAZ 17939 • Touristic path; 02°13′14″S, 079°52′25″W; alt. 14 m; 03.III.2022; M. Barreno obs.; sleeping on a branch; 1 (sex indet.) • Touristic path; 02°13′43.25S, 079°52′04″W; alt. 13 m; 03.III.2022; M. Barreno obs.; sleeping on a branch; 1 (sex indet.).

Identification. The combination of the following characteristics distinguishes this species: large dorsal crest that extends to more than a third of the tail and is not interrupted on the sacrum; enlarged, smooth, nacreous scale near the rear margin of the head below the tympanum on the side of throat; gular pouch with spikes at the front; 7 or 8 supra and infralabials to the midpoint of the eye; and nasal scale less elevated; no conspicuously large scale rows along lower jaw; and well-developed tuberculate scales in the neck region (Taylor 1956; Köhler 1999; Savage 2002).

Distribution. It is found in Costa Rica, Panama, and much of South America between sea level and 1000 m above sea level. In South America, it occurs in Venezuela, Colombia, Ecuador, Peru, Bolivia, Paraguay, and Brazil. In Ecuador, it has been reported from the provinces of Santo Domingo de Los Tsáchilas, Guayas, Manabí, Esmeraldas, Los Ríos, El Oro, Cañar, and Loja, between 8 and 350 m above sea level (Garzón-Santomaro et al. 2019).

Family Tropiduridae

***Stenocercus iridescens* (Günther, 1859)**
Figure 3H

Material examined. ECUADOR – Guayas • Durán, Isla Santay, Touristic path; 02°13′33″S, 079°52′W; alt. 15 m; 03.III.2022; M. Barreno leg.; perched on fallen palm leaf; 1 ♂, QCAZ 17868 • Durán, Isla Santay, Touristic path; 02°11′54″S, 079°51′27″W; alt. 7 m; 26.V.2022; S. Cuadrado leg.; active in the leaf litter; 1 ♂, QCAZ 17942 • Durán, Isla Santay, Touristic path; 02°13′30″S, 079°52′11″W; alt. 11 m; 27.V.2022; S. Cuadrado leg.; active in the leaf litter; 1 ♂, QCAZ 17943.

Identification. This species differs from most other medium-sized diurnal and terrestrial lizards in its area of distribution by having keeled dorsal scales with pointed ends instead of granular scales (Peters and Donoso-Barros 1970). *Stenocercus iridescens* differs from *S. puyango* by lacking a post-femoral mite pocket and posterior circumorbital scales (both present in *S. puyango*) (Torres-Carvajal 2005; Torres-Carvajal 2007).

Distribution. It is distributed in the western foothills and adjacent lowlands of the Northern Andes in Ecuador, southern Colombia, and northern Peru. It is found in an altitude range between sea level and 2381 m above sea level. In Ecuador, it has been reported in the provinces of Pichincha, Cañar, Imbabura, Loja, Los Ríos, Chimborazo, Cotopaxi, El Oro, Santa Elena, Esmeraldas, Guayas, and Manabí (Torres-Carvajal 2007; Garzón-Santomaro et al. 2019).

Family Phyllodactylidae

***Phyllodactylus reissii* Peters, 1862**
Figure 3I

Observations. ECUADOR – Guayas • Durán, Isla Santay, Touristic path; 02°13′34″S, 079°52′1″W; alt. 10 m; 03.III.2022; M. Barreno obs.; foraging on a trunk; 1 (sex indet.).

Identification. *Phyllodactylus reissii* can be separated from most other geckos in Ecuador by its large body size (males 42–75 mm, females 37–73 mm), dorsum with spaced enlarged scales arranged in parallel rows, and lack of enlarged scales on the tail (Arteaga and Aguiar 2020).

Distribution. This species is distributed from sea level to 1461 m above sea level in Ecuador and northern Peru. In Ecuador, it is found in the provinces of Azuay, Cañar, Santa Elena, Guayas, Esmeraldas, Manabí, Loja, El Oro, and introduced to the Galápagos (Dixon and Huey 1970; Díaz 2005; Garzón-Santomaro 2019).

Family Teiidae

***Holcosus septemlineatus* (Duméril & Duméril, 1851)**
Figure 3J

Observations. ECUADOR – Guayas • Durán, Isla Santay, Touristic path; 02°13′34″S, 079°52′1″W; alt. 10 m; 22.VII.2019; M.M. Moretta obs.; foraging; 2 (sex indet.).

Identification. This species differs from other *Holcosus* species by the combination of the following characteristics: frontal scale absent instead of several small scales; mesoptychium with enlarged scales; anterior aspect of the humerus with a row of large smooth scales; six longitudinal rows of ventrals throughout the belly; several small scales separating prefrontals; dorsal head scales strongly furrowed and usually sunken (Peters 1964).

Distribution. This species is distributed in lowlands and foothills in western Colombia and Ecuador. In Ecuador, it has been recorded in the provinces of Esmeraldas, Manabí, Santo Domingo de Los Tsáchilas, Pichincha, Los Ríos, Guayas, Loja, Chimborazo, El Oro, Cotopaxi, Bolívar, Cañar, and Azuay; between 2 and 1404 m above sea level (Harvey et al. 2012; Garzón-Santomaro et al. 2019; Rodríguez-Guerra and Andrango 2020).

Family Sphaerodactylidae

***Gonatodes caudiscutatus* (Günther, 1859)**
Figure 3K1 (male), 3K2 (female)

Material examined. ECUADOR – Guayas • Durán, Isla Santay, Touristic path; 02°13′32″S, 079°51′58″W; alt. 16 m; 22.II.2022; M. Barreno leg.; perched on trunk; 1 ♂, QCAZ 17869 • Durán, Isla Santay, Southern path; 02°13′15″S, 079°52′12″W; alt. 5 m; 22.II.2022; M. Barreno leg.; artificial substrate; 1 ♂, QCAZ 17870.

Identification. This species differs from other *Gonatodes* in having round pupils, a supraciliary spine that is not distinctively enlarged, 17–21 lamellae under the fourth finger, 21–27 lamellae under the fourth toe, and proximal lamellae as wide as digits. Males can be identified based on their distinctive head coloration: bright yellow to orange with contrasting dark brown to black reticulations and a white post humeral ocelli with black

margin. Females and juveniles are brownish overall (Arteaga and Guayasamin 2020).

Distribution. *Gonatodes caudiscutatus* is native to the Chocoan and Tumbesian lowlands of western Ecuador and northwestern Peru and has been introduced into eastern Ecuador and the Galápagos (Olmedo and Cayot 1994; Carvajal-Campos and Torres-Carvajal 2012).

Family Boidae

***Boa imperator* Daudin, 1803**

Figure 3L

Material examined. ECUADOR – Guayas • Durán, Isla Santay, Terraplén path; 02°12′27″S, 079°51′W, alt. 4 m; 03.XI.2017; Christian Guato obs.; 1 (sex indet.) • Durán, Isla Santay, Terraplén path; 02°13′55″S, 079°50′47″W; alt. 4 m; 11.II.2018; A. Narváez and K. Cruz-García leg.; active on branches; 1 (sex indet.), EPN 15872.

Identification. The following characters distinguish this species: absent labial pits; scales on the top of the head and sides of the snout (loreal region) small; the presence of two rows of large scales between the tip and orbital; back of body and tail with large spots that look like closed rings; the presence of nail-like vestigial pelvic girdle organs on each side of the cloaca (Daudin 1803; Duellman 1978; Savage 2002; Scartozzoni and Molina 2004; Carrillo et al. 2005; O'Shea 2007).

Distribution. This species is distributed on both northern coasts of Mexico, throughout Central America, and in South America in the western Andes of Ecuador, Colombia, and probably Peru (O'Shea 2007; Card et al. 2016). In Ecuador, it has been reported from the provinces of Esmeraldas, Manabí, Los Ríos, Guayas, and El Oro (Garzón-Santomaro et al. 2019). It lives from sea level to 1000 m above sea level (Mattison 1995; O'Shea 2007).

Family Colubridae

***Drymarchon melanurus* (Duméril, Bibron & Duméril, 1854)**

Figure 3M

Observations. ECUADOR – Guayas • Durán, Isla Santay, Terraplén path; 02°12′27″S, 079°51′W, alt. 4 m; 26.II.2018; K. Cruz-García and A. Narváez obs.; foraging on the ground; 1 (sex indet.).

Identification. The combination of the following characteristics distinguishes this species: ventral scales 196–214; subcaudals 71–93; color change along the back of adults, paler above and darker behind; oblique black mark to the side of neck present; dark tone in the posterior region of the belly; ventral region of tail dark, and dark or pale subcaudals absent (Wüster et al. 2001; Valencia et al. 2008).

Distribution. This species is distributed from Mexico, through Central America to South America, in northern Venezuela, western Colombia, and Ecuador, and in extreme northwestern Peru (Peters and Orejas-Miranda 1970; Wüster et al. 2001; Cisneros-Heredia 2006b). Its altitudinal distribution ranges from sea level to approximately 2000 m above sea level (Guerra et al. 2012; Garzón-Santomaro et al. 2019). In Ecuador, records of this species exist in Esmeraldas, Guayas, El Oro, Imbabura, Pichincha, Carchi, Azuay, Manabí, and Loja (Cisneros-Heredia 2006b; Almendáriz and Brito 2012; Garzón-Santomaro et al. 2019).

***Lampropeltis micropholis* Cope, 1860**

Figure 3N

Observations. ECUADOR – Guayas • Durán, Isla Santay, Terraplén path; 02°12′27″S,79°51′W, alt. 4 m; 9.XII.2014; K. Cruz-García obs.; foraging on the ground; 1 (sex indet.).

Identification. The following characters characterize this species: rows of dorsal scales, usually 19 or 21; temporal, usually 1+2 or 2+3; subcaudals 44–49 in males, 40–46 in females; ventral 211-225 in males, 211-216 in females; populations of Costa Rica and western Panama may have the entire color pattern darkened by black pigment, in young individuals there is a white band through the prefrontal, in other localities the body rings extend through the belly; Ecuadorian populations have dorsal coloration composed of white, black and red rings, often with black spots on each scale; white snout with black back edges; red and white scales with extensive black marks; divided noses (Dunn 1937; Williams 1994; MECN 2009; Ruane et al. 2014).

Distribution. In Ecuador, this species has been reported from the provinces of Azuay, Tungurahua, Esmeraldas, El Oro, Guayas, Imbabura, Loja, Bolívar, Los Ríos, Manabí, Pichincha, and Santo Domingo de Los Tsáchilas. It is distributed from eastern Costa Rica, through central America, to the south, to Venezuela, Colombia, and Ecuador, and found from sea level to 2915 m above sea level (Cisneros-Heredia 2007; MECN 2009; Ruane et al. 2014; IUCN 2017; Garzón-Santomaro et al. 2019).

***Leptodeira ornata* (Bocourt, 1884)**

Figure 3O

Material examined. ECUADOR – Guayas • Durán, Isla Santay, Touristic path; 02°11′45″S, 079°51′24″W; alt. 14 m; 21.II.2022; M. Barreno leg.; foraging on a branch; 1 (sex indet.), QCAZ 17861 • Durán, Isla Santay, Southern path; 02°13′55″S, 079°50′55″W; alt. 5 m; 22.II.2022; M. Barreno leg.; foraging in the leaf litter; 1♂, QCAZ 17860 • Durán, Isla Santay, Touristic path; 02°13′26″S, 079°52′18″W; alt. 1 m; 24.V.2022; S. Cuadrado leg.; perched on a trunk; 1 (sex indet.), QCAZ 17932.

Identification. The following characteristics distinguish this species: pattern of brown dorsal spots; smooth dorsal scales; belly practically unmarked; elliptical vertical pupil; nape stripe present or absent, if present not connecting with the first dark spot on body (Duellman 1958; Campbell 1998; Savage 2002; Almendáriz and Carr 2012).

Distribution. This species inhabits the western tropical

and subtropical zones, at sea level to 1940 m above sea level (Uetz and Hošek 2016; Garzón-Santomaro et al. 2019). In Ecuador, it has been reported in the provinces of Esmeraldas, Pichincha, Manabí, Los Ríos, El Oro, Guayas, Bolívar, Loja, and Santo Domingo de Los Tsáchilas (Kuch 2002; Almendáriz and Carr 2012; Garzón-Santomaro et al. 2019).

***Leptophis occidentalis* (Günther, 1859)**

Figure 3P

Material examined. ECUADOR – Guayas • Durán, Isla Santay, Southern path; 02°13′55″S, 079°50′55″W; alt. 9 m; 22.II.2022; M. Barreno leg.; sleeping on a branch; 1 ♂, QCAZ 17858.

Identification. This species is distinguished by the following characters: head scales slightly edged with black and with no black spots; adult color pattern with no dark dorsal bands; dorsum uniformly dark blue or greenish blue; keeled dorsal scales, except first dorsal row on each side; keels absent or reduced on the vertebral row; keels on dorsal scale rows II–XIV (or only VI–X) black; no loreal scale; ventrals 147–178 in males, 150–183 in females; subcaudals 130–188 in males, 134–194 in females; dorsal scales of tail with no keels; maxillary teeth 22–24; enlarged spines at first basal row of hemipenial body, papillate calyces more numerous on sulcate side of hemipenial body (De Albuquerque and Fernandes 2022).

Distribution. Atlantic and Pacific coasts of Central America, from Honduras to trans-Andean regions of Colombia, Caribbean coast of Venezuela, to northwestern Ecuador and northern Peru (De Albuquerque and Fernandes 2022).

***Oxybelis transandinus* Torres-Carvajal, Mejía-Guerrero & Terán, 2021**

Figure 3Q

Material examined. ECUADOR – Guayas • Durán, Isla Santay, Touristic path; 02°11′42″S, 079°51′24″W; alt. 10 m; 21.II.2022; M. Barreno leg.; sleeping on an artificial substrate; 1 (sex indet.), QCAZ 17859.

Identification. This species is distinguished from other species of the *Oxybelis aeneus* complex by the combination of the following characteristics: second pair of geneials in contact for most of their length; distinctive dark midventral stripe on the first quarter of belly; supraocular longer than prefrontals; ventrals 176–187 in females; ventral 178–190 in males; throat without dark spots; last supralabial longer than the first temporal; preocular shorter than eye diameter; usually three supralabials in contact with orbit; and usually nine supralabials (Torres-Carvajal et al. 2021).

Distribution. This species is distributed on the Pacific coast of Ecuador below 1044 m above sea level. It has been reported in the provinces of Azuay, Cañar, El Oro, Esmeraldas, Guayas, Loja, Manabí, and Santa Elena, which mainly inhabit dry forests (Torres-Carvajal et al. 2021).

***Oxyrhopus petolarius* (Linnaeus, 1758)**

Figure 3R

Observations. ECUADOR – Guayas • Durán, Isla Santay, Touristic path; 02°11′42″S, 079°51′24″W; alt. 10 m; 17.VII. 2019; M. Moretta obs.

Identification. The combination of the following characters distinguishes this species: supralabials 8 or 9 (4 and 5 or 5 and 6 in contact with the orbit); infralabials 10 (1–6 in contact with the geneials, rarely 1–5), rarely 11 infralabials (when it is the case, usually 1–7 in contact with the geneials); temporary 2+3; dorsal scale rows 19-19-17; dark bands on body, reaching to the margin of ventral bands, at least on front third of body; body bands do not form triads; black snout; ventrals 193–218 in males, 191–222 in females; subcaudals 91–126 in males, 77–110 in females (Lynch 2009).

Distribution. It is distributed from Mexico to the Amazon basin. It occurs in the Pacific foothills from Mexico to South America, and in the Atlantic foothills of Costa Rica (Peters and Orejas-Miranda 1970; Savage 2002). It inhabits the tropical, subtropical, and eastern temperate zones and the tropical, subtropical, and western temperate zones, from approximately sea level to 2,750 m altitude. In Ecuador, it has been reported in the provinces of Sucumbíos, Napo, Orellana, Morona Santiago, Zamora Chinchipe, Pastaza, Tungurahua, Azuay, Esmeraldas, Carchi, Cotopaxi, El Oro, Los Ríos, Manabí, Santa Elena, Guayas, Pichincha, Loja and Santo Domingo de Los Tsáchilas (Wallach et al. 2014; Garzón-Santomaro et al. 2019).

***Dendrophidion brunneum* (Günther, 1858)**

Figure 3S

Material examined. ECUADOR – Guayas • Durán, Isla Santay, Touristic path; 02°12′1″S, 079°51′10″W; alt. 4 m; 26.V.2022; S. Cuadrado leg.; perched in a branch; 1 (sex indet.), QCAZ 17931.

Identification. This species is distinguished from other *Dendrophidion* species by the combination of the following characters: dorsal scale rows 17-17-15 (rarely 17-17-13), with medial rows 7–9 moderately keeled; dorsocaudal reduction of 8–6 on the subcaudals 9–22 in males and 4–10 in females; apical pits 2, present mainly on dorsal neck scales and anterior body; loreal rectangular, bordered by 2–3 or 2–4 supralabials; preoculars usually 1, postoculars 2; supralabials usually 9; infralabials usually 10; ventrals 145–152 in males and 151–165 in females; divided anal plate; subcaudals 139–158 in males and 135–149 in females; hemipenis narrow proximally and quite expanded distally; simple spermatic groove and linear center; unexpanded basal part of body of hemipenis with scattered tiny spines adjacent to spermatic groove; two narrow membranous flights that project perpendicularly to the distal spinous surface and completely surround the hemipenis; apical surface of hemipenis bare except for few vestigial calyces; maxillary teeth 30–38 (Cadle 2010).

Distribution. This species is distributed from the province of Imbabura in northern Ecuador to the vicinity of latitude 08°S in Peru at 5–2700 m above sea level. Most of the records are on the western slope of the Andes of Ecuador, although it has also been found in the Huancabamba depression, a lower area that divides southern Ecuador and Peru and in the inter-Andean valley of northern Peru. In Ecuador, it has been reported in the provinces of Azuay, Chimborazo, Cotopaxi, El Oro, Esmeraldas, Guayas, Imbabura, Los Ríos, Manabí, Pichincha, Santo Domingo de Los Tsáchilas and Loja (Peters and Orejas-Miranda 1970; Cadle 2010; Garzón-Santomaro et al. 2019; Rodríguez-Guerra and Guerra-Correa 2020).

Family Viperidae

***Bothrops asper* (Garman, 1883)**
Figure 3T

Observations. ECUADOR – Guayas • Durán, Isla Santay, Touristic path; 02°11′42″S, 079°51′24″W; alt. 10 m; 5.I.2020; K. Cruz-García obs.; active on the mangrove ground; 1 (sex indet.).

Identification. The combination of the following characteristics distinguishes this species: non-prehensile tail; lacunolabial scale present; lipsticks usually unmarked; subcaudal scales divided, 53–81 in males and 46–73 in females; intersupraocular scales usually keeled 6–9; ventral scales in both sexes usually 185–220; thin postocular stripe that may not occupy either supralabial or present only on the last two; dorsomedial scale rows usually 25–29, long keels on dorsomedial scales extending to head edge of scale but not to the distal edge of scale; back of body tan, brown, olive green, grey, greyish-brown, pinkish or nearly black with edges of dorsal markings aligned diagonally (Campbell and Lamar 2004).

Distribution. It is distributed in Mexico, Guatemala, Honduras, Nicaragua, Costa Rica, Panama, Venezuela, Colombia (including Gorgona Island), Ecuador, and the extreme northwestern corner of Peru. It is found from near sea level to approximately 2640 m above sea level (Wallach et al. 2014). In Ecuador, it has been reported in the provinces of Azuay, Loja, Imbabura, Bolívar, Carchi, Chimborazo, Cañar, Cotopaxi, El Oro, Esmeraldas, Guayas, Manabí, Los Ríos, Pichincha, Santa Elena, and Santo Domingo de Los Tsáchilas. This species is very abundant in the Chongón-Colonche Mountain range (Cisneros-Heredia and Touzet 2004; Almendáriz and Carr 2012; Garzón-Santomaro et al. 2019).

Order Testudines
Family Chelydridae

***Chelydra acutirostris* (Peters, 1862)**
Figure 3U

Observations. ECUADOR – Guayas • Durán, Isla Santay, Touristic path; 02°11′42″S, 079°51′24″W; alt. 10 m; 5.I.2020; A. Narváez and K. Cruz-García obs.; active on the mangrove ground; 1 (sex indet.).

Identification. The following characters characterize this species: flattened and broad carapace with 24 marginal posterior toothed plates and three undetermined keels that disappear with age, five vertebral and eight coastal; third anterior vertebral less wide than the carapace; rigid plastron, very reduced and cross-shaped with the long and narrow, yellowish bridge, so that a large portion of the soft parts of the animal is exposed; gular shield subdivided into two; triangular head with a pointed snout that has a powerful apical hook; chin rods usually 4–6; round warty and not very pronounced neck tubers; long tail and presents three rows of large and keeled scales on the dorsal side (Ernst et al. 1989; Rueda-Almonacid et al. 2007; MECN 2009; Regalado et al. 2012).

Distribution. It is distributed from the south of Honduras to the southern Caribbean in Central America and the Pacific lowlands of Colombia and Ecuador. It has been reported in Ecuador in the provinces of El Oro, Esmeraldas, Manabí, Guayas, Los Ríos, Pichincha, and Santo Domingo de los Tsáchilas, between 50 and 1000 m above sea level (Cisneros-Heredia 2006c; Garzón-Santomaro et al. 2019).

Discussion

Our collaborative monitoring efforts over several years allow us to present an updated checklist of 12 amphibians and 20 reptiles on Isla Santay. This list includes 29 native species, and three introduced invasive species: *Lithobates catesbianus*, the bullfrog previously reported by Cruz-Cordovez et al. (2020), *Hemydactylus frenatus*, and *Anolis sagrei*. We added nine species (*Scinax tsachila*, *Leptodactylus meanonotus*, *Barycholos pulcher*, *Pristimantis achatinus*, *Holcosus septemlineatus*, *Drimarchon melanurus*, *Lampropeltis micropholis*, *Oxyrhopus petolarius* and *Dendrophidion brunneum*) to the lists of Man-Ging (2000), Jaramillo (2002), Samaniego (2011), Zabala-Becilla (2017), and Cruz-Cordovez et al. (2020). We have also identified species previously identified only to the generic level. For instance, Man-Ging (2000) reported *Ameiva* sp. and *Anolis* sp. which we consider to be *Holcosus septemlineatus* and one of the native species of anoles here reported (*Anolis festae* or *Anolis binotatus*). To avoid possible misidentification, we strongly encourage taking photographic records before collecting and preserving specimens.

While Jaramillo (2002) and Samaniego (2011) reported *Eleutherodactylus* sp., *Clelia equatoriana*, *Micrurus* sp., and *Kinosternum leucostomus*, we did not find any of these species in our surveys.

All the species that we report here easily adapt to disturbed ecosystems. However, we found two threatened species, *Engystoos guayaco* (Vulnerable) and *Crocodylus acutus* (Vulnerable), and one Near Threatened species, *Anolis festae* (IUCN 2022). Despite some historical environmental damage on Isla Santay, populations of these three species appear not to be exposed to major local threats except for the presence of introduced

species, as mentioned previously. In addition, light and noise pollution may have negative effects due to the proximity to three nearby cities (Guayaquil, Samborondón, and Durán); light and noise pollution has been reported to alter behavioral patterns of herpetofauna, such as activity periods and communication systems (Perry et al. 2008; French et al. 2018).

Cruz-Cordovez et al. (2020) previously examined the bullfrog population in Santay, and based on the small population, these authors have suggested that this species may have recently established itself or has been enriched by occasional immigration from upstream populations. Although Cruz-Cordovez et al. (2020) hypothesized that this exotic species may be preying on tadpoles or adults of native species, a more recent analysis of the bullfrog diet (Cruz-Cordovez et al. 2021) found no evidence of amphibian predation. However, Cruz-Cordovez et al. (2020) still recommend controlling bullfrog populations and identifying potential sources of colonizers to minimize the spread of bullfrogs to Santay. Since the bullfrog is one of the five exotic species with a high occurrence and negative impact on local biodiversity (MAE 2019), and the population detected in Santay is apparently small, we suggest implementing permanent monitoring of the species to conduct a risk analysis and develop strategies for the exclusion or eradication of this invasive frog.

Hemydactylus frenatus is reported for the first time in Isla Santay. Jadin et al. (2009) first recorded *H. frenatus* in Ecuador, in Manabí, and this species has successfully colonized the coastal and Amazonian regions of Ecuador (Torres-Carvajal 2015). While there is no indication of direct competition with other native species, the prevalence of this reptile on the island implies a potential dominance within the community. Nevertheless, to determine appropriate measures for management or exclusion of this species, a comprehensive evaluation of its population status is necessary.

For the first time, we recorded *Anolis sagrei* on Isla Santay. This island is characterized by its native vegetation and geographic isolation from the *A. sagrei* mainland population (~1 km apart). Previous reports (Amador 2017; Narváez et al. 2020) suggested that *A. sagrei* is associated only with urban habitats in Ecuador. Nonetheless, we found two individuals in a native mangrove ecosystem near the island ecovillage. We hypothesize that lizards or eggs have been accidentally transported one or more accidental times on plants from mainland Ecuador nurseries where *A. sagrei* is common. Considering that we found two native anole species on Isla Santay (*A. binotatus* and *A. festae*) and that *A. sagrei* is highly competitive and can displace other species (Bush et al. 2022), we expect potential interspecific competition on the island. Thus, we suggest two lines of action. First, permanent monitoring of the population of *A. sagrei* in Santay is recommended, and second, in accordance with the recommendations of environmental authorities (MAE 2019) and considering the early detection of the brown anole in a native environment, it is imperative to rapidly implement controls to dispersal caused by reforestation with infested plants and take immediate action to eradicate the exotic lizard from the Santay.

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Author Contributions

Conceptualization: AN. Data curation: JS, KCG, MMMU, SC, MB, AN. Formal analysis: AN, SC, KC. Funding acquisition: AN, NM. Investigation: KCG, AN. Methodology: JS, AT, NM. Supervision: AN. Writing – original draft: KCG. Writing – review and editing: AT, AN, SC, MMMU, NM, MB, JS.

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